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Relevance scale **1** The computation and communication complexity of a parallel banded system solver  D H. Lawrie, A H. SamehMay 1984 **ACM Transactions on Mathematical Software (TOMS)**, Volume 10 Issue 2**Publisher:** ACM PressFull text available:  [pdf\(496.52 KB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#), [review](#)**2** A logic programming approach to knowledge-state planning: Semantics and complexity  Thomas Eiter, Wolfgang Faber, Nicola Leone, Gerald Pfeifer, Axel PolleresApril 2004 **ACM Transactions on Computational Logic (TOCL)**, Volume 5 Issue 2**Publisher:** ACM PressFull text available:  [pdf\(333.40 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

We propose a new declarative planning language, called K, which is based on principles and methods of logic programming. In this language, transitions between states of knowledge can be described, rather than transitions between completely described states of the world, which makes the language well suited for planning under incomplete knowledge. Furthermore, our formalism enables the use of default principles in the planning process by supporting negation as failure. Nonetheless, K also support ...

Keywords: Answer sets, computational complexity, conformant planning, declarative planning, incomplete information, knowledge-states, secure planning

3 Prioritization Methods for Accelerating MDP Solvers 

David Wingate, Kevin D. Seppi

September 2005 **The Journal of Machine Learning Research**, Volume 6**Publisher:** MIT PressFull text available:  [pdf\(542.57 KB\)](#) Additional Information: [full citation](#), [abstract](#)

The performance of value and policy iteration can be dramatically improved by eliminating redundant or useless backups, and by backing up states in the right order. We study several methods designed to accelerate these iterative solvers, including prioritization, partitioning, and variable reordering. We generate a family of algorithms by combining

several of the methods discussed, and present extensive empirical evidence demonstrating that performance can improve by several orders of magnitude ...

4 Level set and PDE methods for computer graphics

 David Breen, Ron Fedkiw, Ken Museth, Stanley Osher, Guillermo Sapiro, Ross Whitaker
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes GRAPH '04**

Publisher: ACM Press

Full text available:  [pdf\(17.07 MB\)](#) Additional Information: [full citation](#), [abstract](#)

Level set methods, an important class of partial differential equation (PDE) methods, define dynamic surfaces implicitly as the level set (iso-surface) of a sampled, evolving nD function. The course begins with preparatory material that introduces the concept of using partial differential equations to solve problems in computer graphics, geometric modeling and computer vision. This will include the structure and behavior of several different types of differential equations, e.g. the level set eq ...

5 Algorithm 795: PHCpack: a general-purpose solver for polynomial systems by homotopy continuation

 Jan Verschelde
June 1999 **ACM Transactions on Mathematical Software (TOMS)**, Volume 25 Issue 2

Publisher: ACM Press

Full text available:  [pdf\(215.20 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Polynomial systems occur in a wide variety of application domains. Homotopy continuation methods are reliable and powerful methods to compute numerically approximations to all isolated complex solutions. During the last decade considerable progress has been accomplished on exploiting structure in a polynomial system, in particular its sparsity. In this article the structure and design of the software package PHC is described. The main program operates in several modes, is menu driven, and i ...

Keywords: Bézout number, Bernshtein's theorem, Schubert calculus, enumerative geometry, homotopy continuation, mixed volume, polyhedral homotopy, polynomial systems, root count, start system

6 The elements of nature: interactive and realistic techniques

 Oliver Deussen, David S. Ebert, Ron Fedkiw, F. Kenton Musgrave, Przemyslaw Prusinkiewicz, Doug Roble, Jos Stam, Jerry Tessendorf
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes GRAPH '04**

Publisher: ACM Press

Full text available:  [pdf\(17.65 MB\)](#) Additional Information: [full citation](#), [abstract](#)

This updated course on simulating natural phenomena will cover the latest research and production techniques for simulating most of the elements of nature. The presenters will provide movie production, interactive simulation, and research perspectives on the difficult task of photorealistic modeling, rendering, and animation of natural phenomena. The course offers a nice balance of the latest interactive graphics hardware-based simulation techniques and the latest physics-based simulation techni ...

7 Parallel hierarchical solvers and preconditioners for boundary element methods

 Ananth Grama, Vipin Kumar, Ahmed Sameh
November 1996 **Proceedings of the 1996 ACM/IEEE conference on Supercomputing (CDROM) - Volume 00 Supercomputing '96**

Publisher: ACM Press, IEEE Computer Society

Full text available: [pdf\(274.38 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

The method of moments is an important tool for solving boundary integral equations arising in a variety of applications. It transforms the physical problem into a dense linear system. Due to the large number of variables and the associated computational requirements, these systems are solved iteratively using methods such as GMRES, CG and its variants. The core operation of these iterative solvers is the application of the system matrix to a vector. This requires $O(n^2)$ operations and memory us ...

8 Complexity of propositional nested circumscription and nested abnormality theories

 Marco Cadoli, Thomas Eiter, Georg Gottlob
April 2005 **ACM Transactions on Computational Logic (TOCL)**, Volume 6 Issue 2

Publisher: ACM Press

Full text available: [pdf\(310.81 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Circumscription has been recognized as an important principle for knowledge representation and common-sense reasoning. The need for a circumscriptive formalism that allows for simple yet elegant modular problem representation has led Lifschitz (AIJ, 1995) to introduce nested abnormality theories (NATs) as a tool for modular knowledge representation, tailored for applying circumscription to minimize exceptional circumstances. Abstracting from this particular objective, we propose LCIRC ...

Keywords: Circumscription, Horn theories, computational complexity, knowledge representation and reasoning, nested abnormality theories, nonmonotonic reasoning

9 The design of I/O-efficient sparse direct solvers

 Florin Dobrian, Alex Pothen
November 2001 **Proceedings of the 2001 ACM/IEEE conference on Supercomputing (CDROM)**

Publisher: ACM Press

Full text available: [pdf\(663.62 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We consider two problems related to I/O: First, find the minimum primary memory size required to factor a sparse, symmetric matrix when permitted to read and write the data exactly once. Second, find the minimum data traffic between core and external memory when permitted to read and write the data many times. These problems are likely to be intractable in general, but we prove upper and lower bounds on these quantities for several model problems with useful sparsity (i.e., whose computational g ...

10 Sets and constraint logic programming

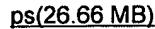
 Agostino Dovier, Carla Piazza, Enrico Pontelli, Gianfranco Rossi
September 2000 **ACM Transactions on Programming Languages and Systems (TOPLAS)**, Volume 22 Issue 5

Publisher: ACM Press

Full text available: [pdf\(648.25 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

In this paper we present a study of the problem of handling constraints made by conjunctions of positive and negative literals based on the predicate symbols $=$, \in , \cup and $\&dvbm0$; (i.e., disjointness of two sets) in a (hybrid) universe of finite sets. We also review and compare the main techniques considered to represent finite sets in the context ...

Keywords: computable set theory, constraints, declarative programming

11 Partitioning and ordering large radiosity computations Seth Teller, Celeste Fowler, Thomas Funkhouser, Pat HanrahanJuly 1994 **Proceedings of the 21st annual conference on Computer graphics and interactive techniques****Publisher:** ACM PressFull text available:  [pdf\(1.39 MB\)](#)  Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)
 [ps\(26.66 MB\)](#)

We describe a system that computes radiosity solutions for polygonal environments much larger than can be stored in main memory. The solution is stored in and retrieved from a database as the computation proceeds. Our system is based on two ideas: the use of visibility oracles to find source and blocker surfaces potentially visible to a receiving surface; and the use of hierarchical techniques to represent interactions between large surfaces efficiently, and to represent the computed radios ...

Keywords: equilibrium methods, multigrid, spatial subdivision**12 GPGPU: general purpose computation on graphics hardware** David Luebke, Mark Harris, Jens Krüger, Tim Purcell, Naga Govindaraju, Ian Buck, Cliff Woolley, Aaron LefohnAugust 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes GRAPH '04****Publisher:** ACM PressFull text available:  [pdf\(63.03 MB\)](#) Additional Information: [full citation](#), [abstract](#)

The graphics processor (GPU) on today's commodity video cards has evolved into an extremely powerful and flexible processor. The latest graphics architectures provide tremendous memory bandwidth and computational horsepower, with fully programmable vertex and pixel processing units that support vector operations up to full IEEE floating point precision. High level languages have emerged for graphics hardware, making this computational power accessible. Architecturally, GPUs are highly parallel s ...

13 Automatic generation of rule-based constraint solvers over finite domains Slim Abdennadher, Christophe RigottiApril 2004 **ACM Transactions on Computational Logic (TOCL)**, Volume 5 Issue 2**Publisher:** ACM PressFull text available:  [pdf\(170.72 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

A general approach to implement propagation and simplification of constraints consists of applying rules over these constraints. However, a difficulty that arises frequently when writing a constraint solver is to determine the constraint propagation algorithm. In this article, we propose a method for generating propagation and simplification rules for constraints over finite domains defined extensionally by, for example, a truth table or their tuples. The generation of rules is performed in two ...

Keywords: Rule-based constraint programming, finite domains, generation of solvers**14 An incremental algorithm for satisfying hierarchies of multiway dataflow constraints** Brad Vander ZandenJanuary 1996 **ACM Transactions on Programming Languages and Systems (TOPLAS)**, Volume 18 Issue 1**Publisher:** ACM PressFull text available:  [pdf\(3.23 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

One-way dataflow constraints have gained popularity in many types of interactive systems

because of their simplicity, efficiency, and manageability. Although it is widely acknowledged that multiway dataflow constraint could make it easier to specify certain relationships in these applications, concerns about their predictability and efficiency have impeded their acceptance. Constraint hierarchies have been developed to address the predictability problem, and incremental algorithms have been ...

Keywords: constraints, incremental constraint satisfaction, interactive systems

15 Ultrascalable Implicit Finite Element Analyses in Solid Mechanics with over a Half a Billion Degrees of Freedom 

Mark F. Adams, Harun H. Bayraktar, Tony M. Keaveny, Panayiotis Papadopoulos
November 2004 **Proceedings of the 2004 ACM/IEEE conference on Supercomputing**

Publisher: IEEE Computer Society

Full text available:  [pdf\(709.02 KB\)](#) Additional Information: [full citation](#), [abstract](#)

The solution of elliptic diffusion operators is the computational bottleneck in many simulations in a wide range of engineering and scientific disciplines. We present a truly scalable-ultrascalable-algebraic multigrid (AMG) linear solver for the diffusion operator in unstructured elasticity problems. Scalability is demonstrated with speedup studies of a non-linear micro-finite element analyses of a human vertebral body with over a half of a billion degrees of freedom on up to 4088 processors on ...

16 Technical papers: A solver for the network testbed mapping problem 

 Robert Ricci, Chris Alfeld, Jay Lepreau
April 2003 **ACM SIGCOMM Computer Communication Review**, Volume 33 Issue 2

Publisher: ACM Press

Full text available:  [pdf\(383.46 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

Network experiments of many types, especially emulation, require the ability to map virtual resources requested by an experimenter onto available physical resources. These resources include hosts, routers, switches, and the links that connect them. Experimenter requests, such as nodes with special hardware or software, must be satisfied, and bottleneck links and other scarce resources in the physical topology should be conserved when physical resources are shared. In the face of these constraint ...

17 Session 6A: BDDs and SAT: Efficient conflict driven learning in a boolean satisfiability solver 

Lintao Zhang, Conor F. Madigan, Matthew H. Moskewicz, Sharad Malik
November 2001 **Proceedings of the 2001 IEEE/ACM international conference on Computer-aided design**

Publisher: IEEE Press

Full text available:  [pdf\(147.03 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

One of the most important features of current state-of-the-art SAT solvers is the use of conflict based backtracking and learning techniques. In this paper, we generalize various conflict driven learning strategies in terms of different partitioning schemes of the implication graph. We re-examine the learning techniques used in various SAT solvers and propose an array of new learning schemes. Extensive experiments with real world examples show that the best performing new learning scheme has at ...

18 Parallel Tridiagonal Equation Solvers 

 Harold S. Stone
December 1975 **ACM Transactions on Mathematical Software (TOMS)**, Volume 1 Issue 4

Publisher: ACM Press

Full text available:  [pdf\(1.23 MB\)](#)Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)**19 Chaff: engineering an efficient SAT solver** Matthew W. Moskewicz, Conor F. Madigan, Ying Zhao, Lintao Zhang, Sharad MalikJune 2001 **Proceedings of the 38th conference on Design automation****Publisher:** ACM PressFull text available:  [pdf\(195.69 KB\)](#)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Boolean Satisfiability is probably the most studied of combinatorial optimization/search problems. Significant effort has been devoted to trying to provide practical solutions to this problem for problem instances encountered in a range of applications in Electronic Design Automation (EDA), as well as in Artificial Intelligence (AI). This study has culminated in the development of several SAT packages, both proprietary and in the public domain (e.g. GRASP, SATO) which find significant use i ...

Keywords: boolean satisfiability, design verification**20 Solving narrow banded systems on ensemble architectures** S. Lennart JohnssonSeptember 1985 **ACM Transactions on Mathematical Software (TOMS)**, Volume 11 Issue 3**Publisher:** ACM PressFull text available:  [pdf\(1.35 MB\)](#)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We present concurrent algorithms for the solution of narrow banded systems on ensemble architectures, and analyze the communication and arithmetic complexities of the algorithms. The algorithms consist of three phases. In phase 1, a block tridiagonal system of reduced size is produced through largely local operations. Diagonal dominance is preserved. If the original system is positive, definite, and symmetric, so is the reduced system. It is solved in a second phase, and the remaining varia ...

Keywords: banded linear systems, multiprocessors

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21 [SUNDIALS: Suite of nonlinear and differential/algebraic equation solvers](#) 

 Alan C. Hindmarsh, Peter N. Brown, Keith E. Grant, Steven L. Lee, Radu Serban, Dan E.

Shumaker, Carol S. Woodward

September 2005 **ACM Transactions on Mathematical Software (TOMS)**, Volume 31 Issue 3

Publisher: ACM Press

Full text available:  [pdf\(253.06 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

SUNDIALS is a suite of advanced computational codes for solving large-scale problems that can be modeled as a system of nonlinear algebraic equations, or as initial-value problems in ordinary differential or differential-algebraic equations. The basic versions of these codes are called KINSOL, CVODE, and IDA, respectively. The codes are written in ANSI standard C and are suitable for either serial or parallel machine environments. Common and notable features of these codes include inexact Newton ...

Keywords: DAEs, ODEs, nonlinear systems, sensitivity analysis

22 [Automated complexity analysis based on ordered resolution](#) 

 David Basin, Harald Ganzinger

January 2001 **Journal of the ACM (JACM)**, Volume 48 Issue 1

Publisher: ACM Press

Full text available:  [pdf\(270.25 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We define order locality to be a property of clauses relative to a term ordering. This property generalizes the subformula property for proofs where the terms appearing in proofs can be bounded, under the given ordering, by terms appearing in the goal clause. We show that when a clause set is order local, then the complexity of its ground entailment problem is a function of its structure (e.g., full versus Horn clauses), and the ordering used. We prove that, in many cases, order locality is ...

Keywords: automated theorem proving, complexity analysis, first-order theories, ordered resolution

23 [Parallel ODE solvers](#) 

 P. J. van der Houwen, B. P. Sommeijer

June 1990 **ACM SIGARCH Computer Architecture News**, Proceedings of the 4th

international conference on Supercomputing ICS '90, Volume 18 Issue 3b**Publisher:** ACM PressFull text available:  [pdf\(1.33 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We are interested in the efficient solution of linear second order Partial Differential Equation (PDE) problems on rectangular domains. The PDE discretisation scheme used is of Finite Element type and is based on quadratic splines and the collocation methodology. We integrate the Quadratic Spline Collocation (QSC) discretisation scheme with a Domain Decomposition (DD) technique. We develop DD motivated orderings of the QSC equations and unknowns and apply the Preconditioned Conjugate Gradient ...

24 SuperLU_DIST: A scalable distributed-memory sparse direct solver for unsymmetric linear systems 

Xiaoye S. Li, James W. Demmel

June 2003 **ACM Transactions on Mathematical Software (TOMS)**, Volume 29 Issue 2**Publisher:** ACM PressFull text available:  [pdf\(659.03 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We present the main algorithmic features in the software package SuperLU_DIST, a distributed-memory sparse direct solver for large sets of linear equations. We give in detail our parallelization strategies, with a focus on scalability issues, and demonstrate the software's parallel performance and scalability on current machines. The solver is based on sparse Gaussian elimination, with an innovative static pivoting strategy proposed earlier by the authors. The main advantage of static pivoting o ...

Keywords: Sparse direct solver, distributed-memory computers, parallelism, scalability, supernodal factorization

25 Abstraction techniques for functional verification: An efficient finite-domain constraint solver for circuits 

G. Parthasarathy, M. K. Iyer, K.-T. Cheng, L.-C. Wang

June 2004 **Proceedings of the 41st annual conference on Design automation****Publisher:** ACM PressFull text available:  [pdf\(204.52 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We present a novel hybrid finite-domain constraint solving engine for RTL circuits, that automatically uses data-path abstraction. We describe how DPLL search can be modified by using efficient finite-domain constraint propagation to improve communication between interacting integer and Boolean domains. This enables efficient combination of Boolean SAT and linear integer arithmetic solving techniques. We use conflict-based learning using the variables on the boundary of control and data-path for ...

Keywords: bit-vector arithmetic, boolean satisfiability, circuits, constraints, decision procedures, design verification, integer linear programming

26 Parallel multigrid solver for 3D unstructured finite element problems 

Mark Adams, James W. Demmel

January 1999 **Proceedings of the 1999 ACM/IEEE conference on Supercomputing (CDROM)****Publisher:** ACM PressFull text available:  [pdf\(803.64 KB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

Keywords: parallel maximal independent sets, parallel sparse solvers, unstructured multigrid

27 Simulation and computation: A multigrid solver for boundary value problems using programmable graphics hardware

Nolan Goodnight, Cliff Woolley, Gregory Lewin, David Luebke, Greg Humphreys

July 2003 **Proceedings of the ACM SIGGRAPH/EUROGRAPHICS conference on Graphics hardware**

Publisher: Eurographics Association

Full text available:  [pdf\(2.80 MB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We present a case study in the application of graphics hardware to general-purpose numeric computing. Specifically, we describe a system, built on programmable graphics hardware, able to solve a variety of partial differential equations with complex boundary conditions. Many areas of graphics, simulation, and computational science require efficient techniques for solving such equations. Our system implements the **multigrid method**, a fast and popular approach to solving large boundary value ...

28 ODEXPERT: an expert system to select numerical solvers for initial value ODE

 **systems**

M. S. Kamel, W. H. Enright, K. S. Ma

March 1993 **ACM Transactions on Mathematical Software (TOMS)**, Volume 19 Issue 1

Publisher: ACM Press

Full text available:  [pdf\(940.02 KB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

ODEXPERT is a prototype knowledge-based system which selects the appropriate numerical solvers for initial value ordinary differential equations. It is capable of deriving some knowledge about the input problem by performing automated tests to detect properties and structures in the problem which guide the selection process.

Keywords: selection of numerical software

29 A graph-constructive approach to solving systems of geometric constraints

 Ioannis Fudos, Christoph M. Hoffmann

April 1997 **ACM Transactions on Graphics (TOG)**, Volume 16 Issue 2

Publisher: ACM Press

Full text available:  [pdf\(593.07 KB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

A graph-constructive approach to solving systems of geometric constraints capable of efficiently handling well-constrained, overconstrained, and underconstrained configurations is presented. The geometric constraint solver works in two phases: in the analysis phase the constraint graph is analyzed and a sequence of elementary construction steps is derived, and then in the construction phase the sequence of construction steps is actually carried out. The analysis phase of the algorithm is de ...

Keywords: complexity, constraint solving, geometric constraints, graph-based constraint solvers, underconstrained systems

30 On the complexity of set-based analysis

Nevin Heintze, David McAllester

August 1997 **ACM SIGPLAN Notices , Proceedings of the second ACM SIGPLAN international conference on Functional programming ICFP '97**, Volume 32

Issue 8

Publisher: ACM Press

Full text available:  [pdf\(1.31 MB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We define a general notion of set-based analysis --- any language whose operational semantics is defined by environment evaluation has a well defined set-based abstraction. This general definition covers both Aiken and Wimmers' type system and Heintze' set-based analysis. Aiken and Wimmers give a nondeterministic exponential time algorithm for their analysis. Heintze gives an $O(n^3)$ procedure. We show that this discrepancy is due to the complexity of the case statements a ...

31 Ultracomputers

 Jacob T. Schwartz

October 1980 **ACM Transactions on Programming Languages and Systems (TOPLAS)**,

Volume 2 Issue 4

Publisher: ACM Press

Full text available:  [pdf\(2.54 MB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

A class of parallel processors potentially involving thousands of individual processing elements is described. The architecture is based on the perfect shuffle connection and has two favorable characteristics: (1) Each processor communicates with a fixed number of other processors. (2) Important communication functions can be accomplished in time proportional to the logarithm of the number of processors. A number of basic algorithms for these "ultracomputers" are presented, and ...

32 Designing efficient algorithms for APL: A case study of a hydraulic-network solver

 Emanuel Gofman, Michael Rodeh

May 1979 **ACM SIGAPL APL Quote Quad , Proceedings of the international**

conference on APL: part 1 APL '79, Volume 9 Issue 4

Publisher: ACM Press

Full text available:  [pdf\(475.57 KB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

The interpretation time of APL instructions significantly influences the total execution time and therefore must be considered during the development of APL programs. As an example of the trade off between interpretation and execution time, the redesign process of a hydraulic network solver originally intended for implementation in FORTRAN is described. Efficiency is gained both by designing algorithms which have a more parallel nature and ...

33 Cost analysis of logic programs

 Saumya K. Debray, Nai-Wei Lin

November 1993 **ACM Transactions on Programming Languages and Systems**

(TOPLAS), Volume 15 Issue 5

Publisher: ACM Press

Full text available:  [pdf\(3.01 MB\)](#)

Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

Keywords: PROLOG, complexity, program analysis

34 Comprehensive frequency-dependent substrate noise analysis using boundary

 **element methods**

Hongmei Li, Jorge Carballido, Harry H. Yu, Vladimir I. Okhmatovski, Elyse Rosenbaum, Andreas C. Cangellaris

November 2002 **Proceedings of the 2002 IEEE/ACM international conference on Computer-aided design**

Publisher: ACM Press

Full text available:  [pdf\(977.52 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We present a comprehensive methodology for the electrodynamic modeling of substrate noise coupling. A new and efficient method is introduced for the calculation of the Green's function that can accommodate arbitrary substrate doping profiles and thus facilitate substrate noise analysis using boundary element methods. In addition to a discussion of the application of the method and its validation in the context of substrate transfer resistance extraction, preliminary results from its application ...

35 A parallel incompressible flow solver package with a parallel multigrid elliptic kernel 

 John Z. Lou, Robert D. Ferraro

December 1995 **Proceedings of the 1995 ACM/IEEE conference on Supercomputing (CDROM) - Volume 00 Supercomputing '95**

Publisher: ACM Press, IEEE Computer Society

Full text available:  [pdf\(565.54 KB\)](#)  [html\(2.49 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

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A parallel time-dependent incompressible flow solver and a parallel multigrid elliptic kernel are described. The flow solver is based on a second-order projection method applied to a staggered finite-difference grid. The multigrid algorithms implemented in the elliptic kernel, which is needed by the flow solver, are V-cycle and full V-cycle schemes. A grid-partition strategy is used in the parallel implementations of both the flow solver and the multigrid elliptic kernel on all fine and coarse g ...

36 Communicating with the user in numerical routines part II: an iterative linear solver in F95 and F2x 

 Aleksandar Donev

September 2001 **ACM SIGPLAN Fortran Forum**, Volume 20 Issue 2

Publisher: ACM Press

Full text available:  [pdf\(687.33 KB\)](#) Additional Information: [full citation](#), [references](#), [index terms](#)

37 Analysis and comparison of two general sparse solvers for distributed memory computers 

 computers

Patrick R. Amestoy, Iain S. Duff, Jean-Yves L'excellent, Xiaoye S. Li

December 2001 **ACM Transactions on Mathematical Software (TOMS)**, Volume 27 Issue 4

Publisher: ACM Press

Full text available:  [pdf\(1.03 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

This paper provides a comprehensive study and comparison of two state-of-the-art direct solvers for large sparse sets of linear equations on large-scale distributed-memory computers. One is a multifrontal solver called MUMPS, the other is a supernodal solver called superLU. We describe the main algorithmic features of the two solvers and compare their performance characteristics with respect to uniprocessor speed, interprocessor communication, and memory requirements. For both solvers, preordi ...

Keywords: Sparse direct solvers, distributed-memory computers, multifrontal and supernodal factorizations, parallelism

38 [An efficient, exact, and generic quadratic programming solver for geometric optimization](#) 

Bernd Gärtner, Sven Schönherr

May 2000 **Proceedings of the sixteenth annual symposium on Computational geometry**

Publisher: ACM Press

Full text available:  pdf(824.59 KB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

39 [GridSAT: A Chaff-based Distributed SAT Solver for the Grid](#) 

Wahid Chrabakh, Rich Wolski

November 2003 **Proceedings of the 2003 ACM/IEEE conference on Supercomputing**

Publisher: IEEE Computer Society

Full text available:  pdf(536.90 KB) Additional Information: [full citation](#), [abstract](#)

We present GridSAT, a parallel and complete satisfiability solver designed to solve non-trivial SAT problem instances using a large number of widely distributed and heterogeneous resources. The GridSAT parallel algorithm uses intelligent backtracking, distributed and carefully scheduled sharing of learned clauses, and clause reduction. Our implementation focuses on dynamic resource acquisition and release to optimize application execution. We show how the large number of computational resources ...

Keywords: Parallel, Distributed, Satisfiability, Computational Grid

40 [A highly accurate fast solver for Helmholtz equations](#) 

Xian-He Sun, Yu Zhuang

July 1997 **Proceedings of the 11th international conference on Supercomputing**

Publisher: ACM Press

Full text available:  pdf(895.03 KB) Additional Information: [full citation](#), [references](#), [index terms](#)

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41 [Parallel frontal solvers for large sparse linear systems](#)

 Jennifer A. Scott
December 2003 **ACM Transactions on Mathematical Software (TOMS)**, Volume 29 Issue 4

Publisher: ACM Press

Full text available:  [pdf\(129.88 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Many applications in science and engineering give rise to large sparse linear systems of equations that need to be solved as efficiently as possible. As the size of the problems of interest increases, it can become necessary to consider exploiting multiprocessors to solve these systems. We report on the design and development of parallel frontal solvers for the numerical solution of large sparse linear systems. Three codes have been developed for the mathematical software library HSL (www.cse.cl ...)

Keywords: Sparse matrices, finite-elements, frontal method, linear systems, parallel processing

42 [A test package for Sturm-Liouville solvers](#)

 J. D. Pryce
March 1999 **ACM Transactions on Mathematical Software (TOMS)**, Volume 25 Issue 1

Publisher: ACM Press

Full text available:  [pdf\(212.42 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

The author and colleagues have produced a collection of 60 test problems which offer a realistic performance test of the currently available automatic codes for eigenvalues of the classical Sturm-Liouville problem. We describe a Fortran implementation and the considerations that went into its design. A novel feature is that (almost) all the code defining one problem is textually contiguous in the Fortran text, unlike for example the DETEST package for ODE initial-value solvers where the def ...

Keywords: Sturm-Liouville problem, test-problem collection, testing software

43 [Skyblue: a multi-way local propagation constraint solver for user interface](#)

 [construction](#)
Michael Sannella
November 1994 **Proceedings of the 7th annual ACM symposium on User interface**

software and technology**Publisher:** ACM PressFull text available:  [pdf\(1.11 MB\)](#)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Many user interface toolkits use constraint solvers to maintain geometric relationships between graphic objects, or to connect the graphics to the application data structures. One efficient and flexible technique for maintaining constraints is multi-way local propagation, where constraints are represented by sets of method procedures. To satisfy a set of constraints, a local propagation solver executes one method from each constraint. SkyBlue is an incremental con ...

Keywords: SkyBlue, constraint hierarchies, constraints, local propagation, user interface implementation

44 Algorithm 817 P2MESH: generic object-oriented interface between 2-D unstructured  **meshes and FEM/FVM-based PDE solvers**

Enrico Bertolazzi, Gianmarco Manzini

March 2002 **ACM Transactions on Mathematical Software (TOMS)**, Volume 28 Issue 1**Publisher:** ACM PressFull text available:  [pdf\(259.04 KB\)](#)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

The software interface P2MESH is a collection of C++ class templates suitable for developing prototypes of high-performance PDE solvers on unstructured 2-D meshes. P2MESH supports several discretization methods on triangles and quadrilaterals, such as finite volume or finite element. The design philosophy of P2MESH does not consider specific model problems or built-in approximation algorithms. The software package is general purpose and it may also be used as a building block in the implementati ...

Keywords: Finite Element, Finite Volume, Object-Oriented programming, PDE solvers, unstructured mesh

45 BerkMin: A Fast and Robust Sat-Solver 

E. Goldberg, Y. Novikov

March 2002 **Proceedings of the conference on Design, automation and test in Europe****Publisher:** IEEE Computer SocietyFull text available:  [pdf\(150.03 KB\)](#)Additional Information: [full citation](#), [abstract](#), [citations](#) [Publisher Site](#)

We describe a SAT-solver, BerkMin, that inherits suchfeatures of GRASP, SATO, and Chaff as clause recording,fast BCP, restarts, and conflict clause "aging". At thesame time BerkMin introduces a new decision makingprocedure and a new method of clause databasemanagement. We experimentally compare BerkMin withChaff, the leader among SAT-solvers used in the EDAdomain. Experiments show that our solver is more robustthan Chaff. BerkMin solved all the instances we used in experiments including very larg ...

46 Integrating pointer variables into one-way constraint models 

Brad Vander Zanden, Brad A. Myers, Dario A. Giuse, Pedro Szekely

June 1994 **ACM Transactions on Computer-Human Interaction (TOCHI)**, Volume 1 Issue 2**Publisher:** ACM PressFull text available:  [pdf\(3.71 MB\)](#)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Pointer variables have long been considered useful for constructing and manipulating data

structures in traditional programming languages. This article discusses how pointer variables can be integrated into one-way constraint models and indicates how these constraints can be usefully employed in user interfaces. Pointer variables allow constraints to model a wide array of dynamic application behavior, simplify the implementation of structured objects and demonstrational systems, and improve ...

Keywords: Garnet, constraints, development tools, incremental algorithms

47 The use of imbedded patterns and canonical forms in a self-improving problem solver 

 Alistair D. C. Holden, David L. Johnson

January 1967 **Proceedings of the 1967 22nd national conference**

Publisher: ACM Press

Full text available:  [pdf\(798.77 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

The aim of the work reported here was to develop problem-solving programs which would solve non-trivial problems and make use of their experience. In all of the work published previously there is a clearly discernible trade-off between problem-solving power and generality. This deadlock could be broken by the development of (a) programs which can make use of their experience and generalize it, and (b) powerful symbol manipulation languages which can express and execute highly complex proces ...

48 Parallel Iterative Solvers of GeoFEM with Selective Blocking Preconditioning for Nonlinear Contact Problems on the Earth Simulator 

Kengo Nakajima

November 2003 **Proceedings of the 2003 ACM/IEEE conference on Supercomputing**

Publisher: IEEE Computer Society

Full text available:  [pdf\(544.30 KB\)](#) Additional Information: [full citation](#), [abstract](#)

An efficient parallel iterative method with selective blocking preconditioning has been developed for symmetric multiprocessor (SMP) cluster architectures with vector processors such as the Earth Simulator. This method is based on a three-level hybrid parallel programming model, which includes message passing for inter-SMP node communication, loop directives by OpenMP for intra-SMP node parallelization and vectorization for each processing element (PE). This method provides robust and smooth con ...

49 On the complexity of list scheduling algorithms for distributed-memory systems 

 Andrei Rădulescu, Arjan J. C. van Gemund

May 1999 **Proceedings of the 13th international conference on Supercomputing**

Publisher: ACM Press

Full text available:  [pdf\(965.35 KB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

50 PILS: an iterative linear solver package for ill-conditioned systems 

 C. Pommerell, W. Fichtner

August 1991 **Proceedings of the 1991 ACM/IEEE conference on Supercomputing**

Publisher: ACM Press

Full text available:  [pdf\(1.29 MB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

51 Backtracking without trailing in CLP (RLin) 

Pascal Van Hentenryck, Viswanath Ramachandran

July 1995 **ACM Transactions on Programming Languages and Systems (TOPLAS)**,

Volume 17 Issue 4

Publisher: ACM Press

Full text available: [pdf\(2.45 MB\)](#)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

Existing CLP languages support backtracking by generalizing traditional Prolog implementations: modifications to the constraint system are trailed and restored on backtracking. Although simple and efficient, trailing may be very demanding in memory space, since the constraint system may potentially be saved at each choice point. This article proposes a new implementation scheme for backtracking in CLP languages over linear (rational or real) arithmetic. The new scheme, called

Keywords: backtracking, constraint logic programming, trailing

52 Combinatorics, complexity, and randomness

Richard M. Karp

February 1986 **Communications of the ACM**, Volume 29 Issue 2

Publisher: ACM Press

Full text available: [pdf\(1.13 MB\)](#)Additional Information: [full citation](#), [abstract](#), [citations](#), [index terms](#), [review](#)

The 1985 Turing Award winner presents his perspective on the development of the field that has come to be called theoretical computer science.

53 Complexity of parallel QR factorization

M. Cosnard, Y. Robert

August 1986 **Journal of the ACM (JACM)**, Volume 33 Issue 4

Publisher: ACM Press

Full text available: [pdf\(734.87 KB\)](#)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

An optimal algorithm to perform the parallel QR decomposition of a dense matrix of size N is proposed. It is deduced that the complexity of such a decomposition is asymptotically $2N$, when an unlimited number of processors is available.

54 MARS: a MAPLE/MATLAB/C resultant-based solver

Aaron Wallack, Ioannis Z. Emiris, Dinesh Manocha

August 1998 **Proceedings of the 1998 international symposium on Symbolic and algebraic computation**

Publisher: ACM Press

Full text available: [pdf\(329.55 KB\)](#)Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

55 Run-time performance optimization of an FPGA-based deduction engine for SAT solvers

Andreas Dandulis, Viktor K. Prasanna

October 2002 **ACM Transactions on Design Automation of Electronic Systems (TODAES)**, Volume 7 Issue 4

Publisher: ACM Press

Full text available: [pdf\(375.20 KB\)](#)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

FPGAs are a promising technology for accelerating SAT solvers. Besides their high density, fine granularity, and massive parallelism, FPGAs provide the opportunity for run-time customization of the hardware based on the given SAT instance. In this article, a parallel deduction engine is proposed for backtrack search algorithms. The performance of the deduction engine is critical to the overall performance of the algorithm because, for any

moderate SAT instance, millions of implications are deriv ...

Keywords: Adaptive computing, Boolean satisfiability, configurable, high performance, performance trade-offs, reconfigurable components, reconfigurable computing, reconfigurable systems

56 PYTHIA-II: a knowledge/database system for managing performance data and recommending scientific software

 Elias N. Houstis, Ann C. Catlin, John R. Rice, Vassilios S. Verykios, Naren Ramakrishnan, Catherine E. Houstis

June 2000 **ACM Transactions on Mathematical Software (TOMS)**, Volume 26 Issue 2

Publisher: ACM Press

Full text available:  [pdf\(796.18 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Often scientists need to locate appropriate software for their problems and then select from among many alternatives. We have previously proposed an approach for dealing with this task by processing performance data of the targeted software. This approach has been tested using a customized implementation referred to as PYTHIA. This experience made us realize the complexity of the algorithmic discovery of knowledge from performance data and of the management of these data together with the d ...

Keywords: data mining, inductive logic programming, knowledge discovery in databases, knowledge-based systems, performance evaluation, recommender systems, scientific software

57 A note on checking matrix products (extended abstract)

 B. Ravikumar

March 1992 **Proceedings of the 1992 ACM/SIGAPP symposium on Applied computing: technological challenges of the 1990's**

Publisher: ACM Press

Full text available:  [pdf\(813.95 KB\)](#) Additional Information: [full citation](#), [references](#), [index terms](#)

58 CAMA: A Multi-Valued Satisfiability Solver

Cong Liu, Andreas Kuehlmann, Matthew W. Moskewicz

November 2003 **Proceedings of the 2003 IEEE/ACM international conference on Computer-aided design**

Publisher: IEEE Computer Society

Full text available:  [pdf\(285.37 KB\)](#) Additional Information: [full citation](#), [abstract](#), [index terms](#)

This paper presents the multi-valued SAT solver CAMA. CAMA generalizes the recently developed speed-up techniques used in state-of-the-art binary SAT solvers, such as the two-literal-watching scheme for Boolean constraint propagation (BCP), conflict-based learning with identifying the first unique implication point (UIP), and non-chronological back-tracking. In addition, a novel minimum value set (MVS) technique is introduced for improving the efficiency of conflict-based learning. By analyzing th ...

59 Session 2: Rent's rule Analysis and Congestion Estimation: Perimeter-degree: a

 **priori metric for directly measuring and homogenizing interconnection complexity in multilevel placement**

Navaratnasothie Selvakkumaran, Phiroze N. Parikh, George Karypis

April 2003 **Proceedings of the 2003 international workshop on System-level**

interconnect prediction**Publisher:** ACM PressFull text available:  [pdf\(118.50 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In this paper, we describe an accurate metric (perimeter-degree) for measuring interconnection complexity and effective use of it for controlling congestion in a multilevel framework. Perimeter-degree is useful for uniformly spreading interconnection density. In modern designs interconnects consume significant area and power. By making interconnect spread homogeneous, it is possible to improve routability as well as power dissipation distribution. Most of the existing congestion minimization heur ...

Keywords: congestion, interconnection complexity, multilevel global placement,, nonhomogeneity, perimeter-degree, routability

60 General framework for removal of clock network pessimism Jindrich Zejda, Paul FrainNovember 2002 **Proceedings of the 2002 IEEE/ACM international conference on Computer-aided design****Publisher:** ACM PressFull text available:  [pdf\(150.88 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

The paper presents a simple yet powerful general theoretical framework and efficient implementation for removal of clock network timing pessimism. We address pessimism in static timing analysis (STA) tools caused by considering delay variation along common segments of clock paths. The STA tools compute setup (hold) timing slack based on conservative combinations of late (early) launching and early (late) capturing arrival times. To avoid exponential-time path-based analysis the STA tools use bot ...

Keywords: clock network reconvergence, deep sub-micron, process, static timing analysis, voltage and temperature delay variation

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based on their empirical **Complexity** graph, if The **constraint ratio** of P is small,

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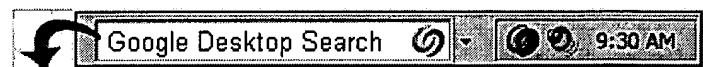
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